Aug. 21, 1923. 1,465,705

E. E. WRIGHT

CABLE EQUALIZER

Filed Feb. 28, 1921 2 Sheets-Sheet 1

Fig. 2.

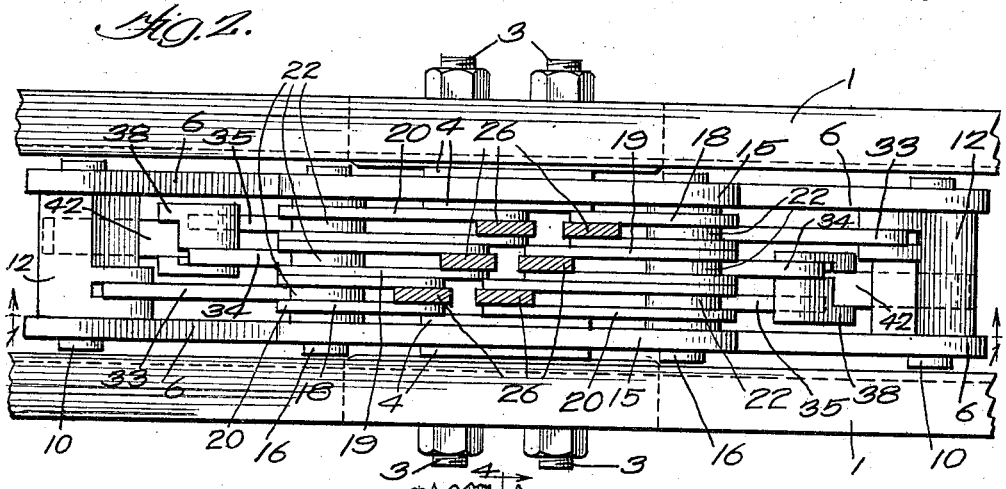
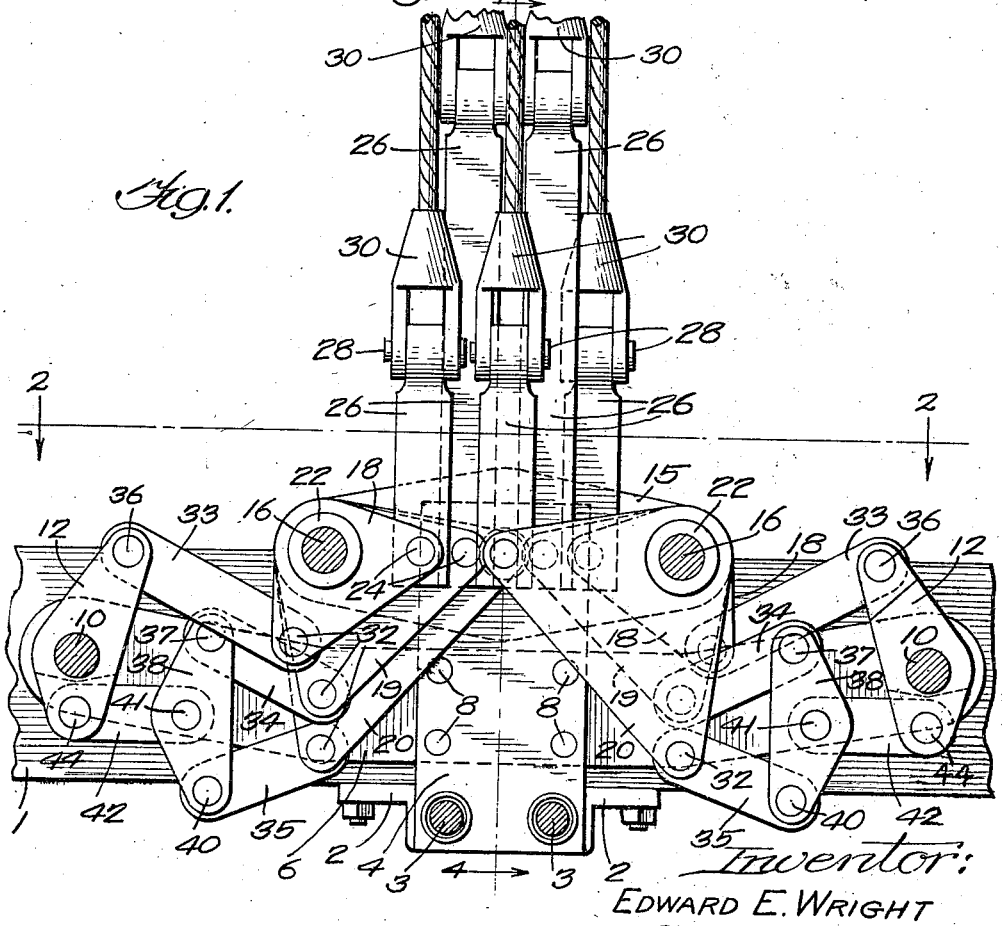


Fig. 1.



Inventor:
EDWARD E. WRIGHT
By Cheever & Cox
Attys

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2 Sheets-Sheet 2

Fig. 3.

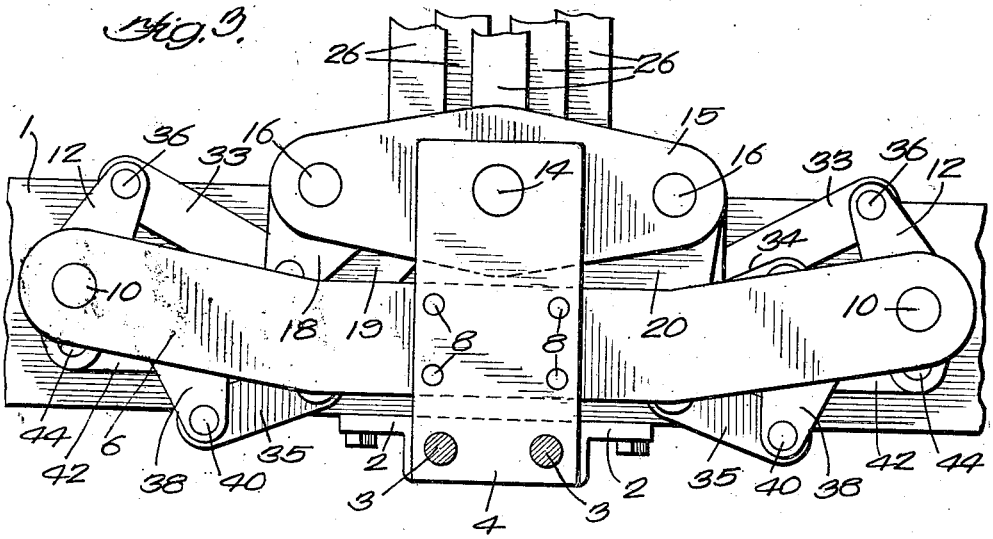


Fig. 4.

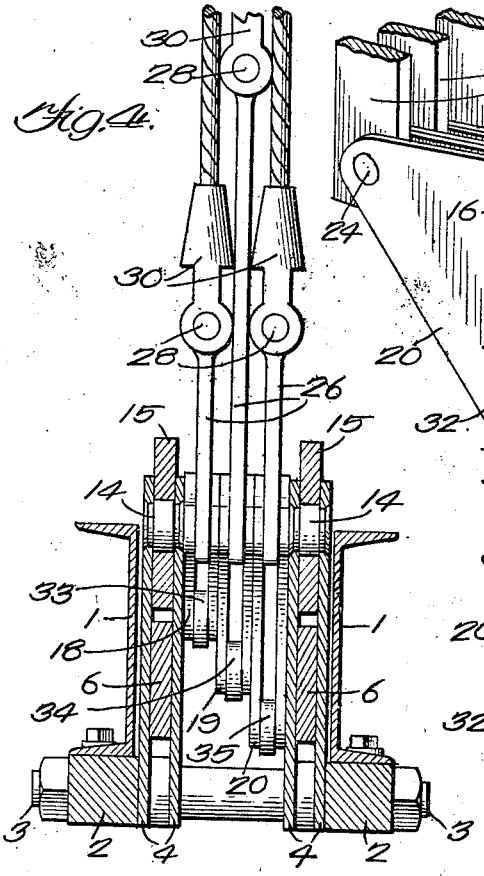


Fig. 6.

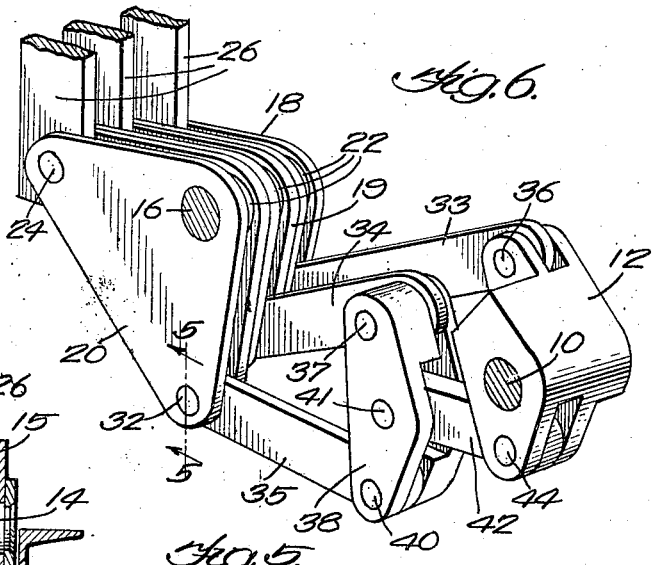
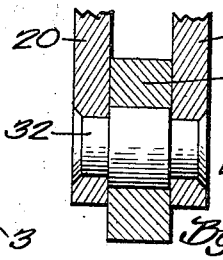


Fig. 5.



Inventor:
EDWARD E. WRIGHT
By Cheever & Cox
Atty's

Patented Aug. 21, 1923. 1,465,705

UNITED STATES PATENT OFFICE.

EDWARD E. WRIGHT, OF DETROIT, MICHIGAN.

CABLE EQUALIZER.

Application filed February 23, 1921. Serial No. 448,675.

To all whom it may concern:

Be it known that I, EDWARD E. WRIGHT, a citizen of the United States, residing at 645 Calvert Avenue, Detroit, in the county of Wayne and State of Michigan, have invented a certain new and useful Improvement in Cable Equalizers, of which the following is a specification.

My invention relates to equalizers for elevators, and an object of the invention is to provide means for equalizing the tension on the various ropes even though they be of considerable number. Another object is to provide an equalizer so constructed that the adjacent rope ends may be spaced closely together. The overhead sheaves of rope suspended elevators normally have their grooves located close together, and it is evident that if the rope ends at the suspended car are widely spread they will not run true but will press with greater force against one side of the groove, and hence, will be subjected to excessive wear and will produce an excessive amount of friction. As the result of my invention the ropes may be spaced so closely together that they will lie practically, if not actually, in the planes of the respective grooves.

I accomplish my objects by the mechanism illustrated in the accompanying drawings in which—

Figure 1 is a side elevation of the chief operating parts of the equalizer, the view being taken on the line 1—1, Figure 2.

Figure 2 is a plan section on the line 2—2, Figure 1.

Figure 3 is a side elevation of the chief operating parts, the view being taken just inside of the I-beam which in the present design forms one of the supporting beams of the car.

Figure 4 is a sectional elevation on the line 4—4 Figure 1.

Figure 5 is a sectional detail on the line 5—5, Figure 6.

Figure 6 is a perspective view of one of the groups of bell cranks and their connecting links and levers.

Like numerals denote like parts thruout the several views.

The beam which supports the elevator car may be varied in design, but in the present case consists of two parallel I-beams 1 spaced a short distance apart to partially enclose the equalizing mechanisms between them. Beneath these beams are fastened brackets 2 through which pass heavy bolts 3 designed to carry the weight of the car. Said bolts pass through two pairs of strap plates 4, the plates of each pair being spaced apart and fastened to a flat bar 6 located between them, as best shown in Figures 2 and 4. The parts 4, 6 are fastened together by rivets 8 or other appropriate means shown in Figures 1 and 3. The planes of the bars 6 are vertical, and the bars extend for a considerable distance horizontally in both directions from the straps 4. At their ends are fastened heavy pins 10 which extend from one beam to the other and form fulcrums for levers 12 which for identification may be referred to as the "primary levers". These will be again referred to.

Near the upper end of each pair of straps 4 is a heavy pin 14 which forms a fulcrum for an oscillating lever 15. There are thus two of these levers which are arranged parallel to each other at opposite sides of the device. Two fulcrum shafts 16 are mounted in the levers 15, on opposite sides of the fulcrum 14, these shafts extending from one lever to the other and forming fulcrums for the bell cranks 18, 19, 20. Said bell cranks are in the form of plates arranged vertically, in pairs, the plates of a pair being separated by spacers 22 best shown in Figures 1 and 2. Each pair of plates constituting the respective bell cranks has mounted in it, approximately on a level with the fulcrum shaft 16, a pin 24 which forms a pivotal connection to an eye bar 26. These bars are arranged vertically with their eyes at the upper end for receiving shackle bolts 28 by which they are pivotally connected to rope sockets 30. These rope sockets or shackles or beckets may assume different forms, the essential idea being that they are fastened to the respective ropes at one end and to the bell cranks at the other end, and it is in this sense that I employ the term "rope sockets" in the appended claims.

At the lower end of the bell cranks are pins 32 which form pivotal connections for links 33, 34, 35. The link 33 is connected to the upper end of the primary lever 12 by a pin 36. The link 34 is connected by a pin 37 to the upper end of a secondary lever 38. The link 35 is connected by a pin 40 to the lower end of lever 38. Between its ends lever 38 is connected by a pin 41 to a link 42. This link is connected

by a pin 44 to the lower end of the primary lever 12. These connections are well shown in Figures 1 and 6. As shown, the bell cranks and their connecting links and levers are duplicated on opposite sides of the shaft 14 and therefore are balanced as one group against the other. In other words, there are two groups of bell cranks 18, 19, 20 and one group is pivotally connected to one end of the levers 15 and the other group is pivotally connected to the opposite end of said levers, and hence there is an equalizing or balancing effect as between the two groups.

As the plates which form the bell cranks are arranged vertically, they can be and are placed closely together, thus making it possible to bring the rope sockets closer together so that the ropes may come in the plane of their respective grooves in the overhead sheave. In other words, the planes of the eye bars 26 are spaced closer together, two bars to a plane, as best shown in Figure 2. Furthermore the eye bars when viewed in plan, as in Figure 2, are arranged in echelon, or offset relation, the result being that the centers of the rope sockets are offset from each other and hence may be brought closer together than if they were arranged in straight longitudinal and transverse rows; for it will be understood that the diameter of a rope socket is necessarily considerably greater than the diameter of its rope and the sockets would interfere with each other if arranged closely in rows at right angles to each other. This oblique or staggered arrangement of the eye bars, rope sockets and ropes is made possible by a novel expedient, viz.: The making of the bell cranks in graded lengths. To illustrate, the arms of the bell crank arm 20 are longer than those of the bell crank 19, and the arms of the bell crank 19 are longer than those of the bell crank 18. Furthermore, the bell crank 18, whose arms are shortest, lies in the same plane as the bell crank 20 whose arms are longest, while the center bell cranks 19 which lie between the two outer ones, are of equal length. To still further reduce the horizontal area occupied by the group of rope sockets, it is desirable that the eye bars of some of them be longer than the eye bars of the others, as best illustrated in Figures 1 and 4. Thus in the construction shown the eye bars are of different lengths thus bringing the sockets at different elevations; and the bell cranks are of different lengths, arranged with a short crank in the plane of a long one and vice versa.

The operation will now be readily understood. Due to unequal stretching of the ropes, or for other causes, well known to those familiar with this class of mechanism, there would be a tendency for the ropes to exert different degrees of tension upon the car beam in case they were all rigidly fastened to it. With my mechanism, however, if the tension in one rope is greater than in another, it will tend to pull upward on the arm of the bell crank to which it is attached, and this in turn will cause such bell crank to pull horizontally inward on the attached link 33, 34 or 35, as the case may be. This pull will, through the action of the connected links and levers, be distributed equally to the other bell cranks of the group, thus equalizing the tension of all the ropes in that group. The tension between the two groups, as groups, that is, the tension of the two groups will be equalized through the medium of the oscillating beam 15 which is adapted to rotate through a limited arc in either direction about the fixed fulcrums 14. Consequently the tension of all of the ropes is equalized and, as before stated, the ropes themselves may be and are compactly grouped together so that they may run true upon their sheaves.

It will be understood that, viewed in its broadest aspect, the invention is not limited to bell cranks specifically, for bell cranks are simply levers of a special type having a work arm and a power arm, as in other levers, and it is not essential in the broadest sense that the elements 18, 19, 20 have their work arms arranged at right angles to their power arms as in the design illustrated. I have therefore referred to them in some of the appended claims broadly as "levers", thus intending in such claims to include mechanism in which the angles between the work arms and power arms differ from 90 degrees.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A rope equalizer for elevators comprising a fulcrum fixed to the suspended object, a lever pivoted on said fulcrum, a plurality of bell cranks, and a rope socket connected to each bell crank, one of said bell cranks being connected to one end of said lever and another of said bell cranks being connected to the other end of said lever, said cranks being in the form of plates arranged in parallel vertical planes, whereby they may be closely spaced.

2. A rope equalizer for elevators comprising a fulcrum fixed to the suspended object, bell cranks, a primary lever pivoted on said fulcrum, a secondary lever fulcrumed upon one end of the primary lever, the other end of the primary lever being connected to one of the bell cranks and the secondary lever being connected at its ends to others of the bell cranks, and means for connecting the individual bell cranks to the elevator cables.

3. A rope equalizer for elevators comprising a fulcrum fixed to the suspended object, bell cranks consisting of parallel plates arranged vertically and adapted to be indi-

vidually connected to the elevator cables, a primary lever pivoted on said fixed fulcrum, one end of said lever being connected to one of said bell cranks, a secondary lever connected to the other end of the primary lever at a point between the ends of the secondary lever, the secondary lever being connected at opposite ends to two others of the bell cranks.

4. A rope equalizer for elevators comprising a fulcrum fixed to the suspended object, bell cranks consisting of parallel plates arranged vertically and adapted to be individually connected to the elevator cables, a primary lever pivoted on said fixed fulcrum, a link connecting one end of said lever to one of said bell cranks, a second link connected to the other end of said primary lever, and a secondary lever connected between its ends to the second link, the secondary lever being connected at its ends to two others of the bell cranks.

5. A rope equalizer for elevators comprising a fulcrum fixed to the suspended object, bell cranks consisting of parallel plates arranged vertically and adapted to be individually connected to the elevator cables, a primary lever pivoted on said fixed fulcrum, a link connecting one end of said lever to one of said bell cranks, a second link connected to the other end of said primary lever, a secondary lever connected between its ends to the second link, the secondary lever being connected at its ends to two others of the bell cranks, and a shaft upon which all of said bell cranks are fulcrumed, said shaft being connected to said suspended object.

6. A rope equalizer for elevators comprising a plurality of groups of rope sockets, a plurality of groups of bell cranks, one for each of said sockets, means for equalizing the tension of the individual sockets on their respective bell cranks, and means for equalizing the tension on the two groups of sockets.

7. A rope equalizer for elevators comprising a plurality of groups of rope sockets, a plurality of groups of bell cranks, one for each of said sockets, means for equalizing the tension of the individual sockets on their respective bell cranks, an oscillating beam having a fulcrum shaft fastened to the suspended object, said beam carrying the fulcrums of the bell cranks on opposite sides of said shaft for equalizing the tension of the two groups.

8. A rope equalizer for elevators comprising an oscillating beam pivotally fastened to the suspended object, and two groups of elements connected to the opposite ends of said beam whereby the tension of said groups is equalized, each group of elements comprising a fixed fulcrum fastened to the suspended object, a lever pivoted on said fulcrum, a plurality of bell cranks, and a rope socket connected to each bell crank, one of said bell cranks being connected to one end of said lever and another of said bell cranks being connected to the other end of said lever, the fulcrums of the bell cranks being carried by said beam on opposite sides of the pivotal support thereof.

9. A rope equalizer for elevators comprising an oscillating beam pivotally fastened to the suspended object, and two groups of elements connected to the opposite ends of said beam whereby the tension of said groups is equalized, each group of elements comprising a fixed fulcrum fastened to the suspended object, bell cranks consisting of parallel plates arranged vertically and adapted to be individually connected to the elevator ropes, a primary lever pivoted on said fixed fulcrum, a link connecting one end of said lever to one of said bell cranks, a second link connected to the other end of said primary lever, and a secondary lever connected between its ends to the second link, the secondary lever being connected at its ends to two others of the bell cranks, and the bell cranks being pivotally supported upon the beam on opposite sides of the support thereof.

10. Equalizing mechanism for the ropes of elevators, said mechanism having a plurality of levers arranged in close proximity in parallel vertical planes, rope sockets attached to one end of each of said levers, and means attached to the other end of each of said levers for interconnecting them and equalizing the tension of the rope sockets upon said levers, said levers being in the form of vertically arranged plates and all of them being fulcrumed about a common axis.

11. A rope equalizer for elevators having two groups of levers, each group consisting of a plurality of plates arranged in close proximity in parallel vertical planes, rope sockets attached to the inner end of the individual levers, and means attached to the outer end of the individual levers of each group for interconnecting them and equalizing the tension of the rope sockets thereon, an oscillating beam having an axis fixed relatively to the suspended car, and fulcrums carried by said beam on opposite sides of said axis for pivotally supporting all of the levers of a group.

12. A rope equalizer for elevators having levers arranged parallel to each other and co-axial and adapted to rotate in vertical planes, rope sockets pivotally connected to the power arms of said levers, and equalizing mechanism pivoted to the opposite ends of said levers, the power arms of said levers being graded in length to enable the rope sockets to be brought into a small space transverse to the planes of the levers.

13. A rope equalizer for elevators having levers arranged parallel to each other and

adapted to rotate in vertical planes, bars pivotally attached to the power arms of said levers, rope sockets fastened to the upper ends of said bars, and equalizing mechanism pivoted to the opposite ends of said levers, the bars being of different lengths whereby the rope sockets come at different elevations, thereby enabling them to be brought closely together, horizontally.

14. A rope equalizer for elevators having two groups of levers, the levers of a single group being rotatable about a common horizontal axis, rope sockets connected to the power arms of said levers, equalizing mechanism connected to the other end of said levers, and an oscillating beam whereon the two groups of levers are mounted, the power arms of the levers of a single group being graded in length, and a long lever of one group being arranged in the same plane and opposite to the short lever of the other group, and vice versa.

15. An equalizing device for connecting cables and a draft head comprising groups of bell-crank levers having arms extending toward a common center, means for connecting such arms to cables, and means for connecting the other arms of the levers of both groups in such manner that the stresses of the several arms are balanced against each other and the stresses in the levers of one group oppose the stresses in the levers of the other group.

16. A draft head comprising parallel spaced pivot members, a plurality of bell-crank levers having arms of different lengths extending horizontally toward the center from both pivot members, means for attaching a cable to each arm, and means for movably connecting the other arms of said bell-crank levers to cause an equal distribution of the load to the several cables.

17. A draft head comprising fixed spaced pivot members, a plurality of levers on each pivot member having arms which extend toward a common center and are adapted to be connected to cables, and connections between said levers arranged to maintain equal the tensions of the several cables.

18. In an equalizing device, in combination three levers of different lengths mounted on a fixed pivot and adapted to be connected to cables, and equalizing lever connections arranged to cause upward movement of one lever to produce such downward movement of one or both of the other levers that the sum of the downward movements will be equal to the upward movement of the first lever.

19. A draft head comprising parallel pivot members supported in fixed spaced relation, a group of levers mounted on each pivot having cable attaching arms of different lengths extending toward a common center, a floating member, connections between each group of levers and the floating member comprising links and levers arranged to transmit equal forces from each of the several levers of the group to the floating member.

20. An equalizing device for connecting cables and a draft head comprising groups of bell-crank levers having arms extended toward a common center, means for connecting such arms to cables, means for connecting the other arms of the levers of each group in such manner that the stresses of the several arms are balanced against each other, and means for balancing the collective stresses in the levers of one group against the collective stresses of the levers of the other group.

21. A draft head, pivot members spaced with respect to a common center, balancing means for the pivot members carried by the draft head, a plurality of bell-crank levers having arms of different lengths extending horizontally toward the center from each pivot member, means for attaching a cable to each arm, and means for connecting the other arms of the bell-crank levers to cause an equal distribution of the load to the several cables in each group.

22. A draft head, pivot members spaced with respect to a common center, balancing means for the pivot members carried by the draft head, a group of levers on each pivot member having arms which extend toward the common center and are adapted to be connected to cables, and connections between the levers in each group arranged to maintain equal tension of the several cables.

23. In an equalizing device, three levers of different lengths mounted on a common pivot and adapted to be connected to cables, and equalizing lever connections arranged to cause upward movement of one lever to produce such downward movement of one or both of the other levers that the sum of the downward movement will be equal to the upward movement of the first lever.

24. A rope equalizer for elevators having levers arranged parallel to each other and adapted to rotate in vertical planes, rope sockets pivotally connected to the power arms of said levers, and equalizing mechanism pivoted to the opposite ends of said levers, the power arms of said levers being graded in length to enable the rope sockets to be brought into a small space transverse to the planes of the levers.

In witness whereof, I have hereunto subscribed my name.

EDWARD E. WRIGHT.